

## REMARKS

The enclosed is responsive to the Examiner's Office Action mailed on February 25, 2008. At the time the Examiner mailed the Office Action claims 32, 34, 36-45, 47-49, and 51-55 were pending. By way of the present response Applicant has: 1) amended claims 32, 34, 36-38, 42-45, 47-49, and 54-55 in order to more particularly point out and distinctly claim the subject matter which Applicant regards as the invention; 2) added no claims; and 3) canceled no claims. As such, claims 32, 34, 36-45, 47-49, and 51-55 are now pending. Applicant respectfully requests reconsideration of the present application and allowance of all claims now presented

### Claim Amendments

Applicant specifically directs the Examiner's attention to the amendment of independent claim 42. Claim 42 is presently amended to replace the phrases "liquid DI water" and "DI rinse water" with the phrase "liquid DI rinse water." In addition, Applicant respectfully directs the Examiner's attention to the portion of claim 42 on page 5, line 1 of the claims filed by Applicant on October 29, 2007, which reads:

"with or while [[, and]] the liquid DI water ~~is are each applied separately to~~ dispensed"

Applicant's inclusion of the term "liquid" in claim 42 on October 29, 2007 was made without being correctly identified in underlining. Applicant has included the appropriate markings identifying the changes in the present amendment.

### Claim Rejections – 35 U.S.C. § 102

The Examiner has rejected claims 32, 37, 41, 47, 48, 51, and 52 under 35 U.S.C. § 102(b) as being anticipated by *EP 095747*, and also under 35 U.S.C. § 102(e) as being anticipated by *Mertens et al*, US Patent No. 6,491,764, hereinafter "*Mertens*." The Examiner rejected claims 32, 34, 36-38, 40-44, 47-49 and 53-55 under U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,460, 552 by *Lorimer* (hereinafter "*Lorimer*").

Applicant claims in independent claims 32, 37, and 42 a method of cleaning a substrate (for convenience only, similar elements of claims 32, 37, and 42 are described together using terminology of claim 32) comprising: exposing the frontside of the spinning substrate to an etchant or cleaning chemical, then rinsing the frontside of the substrate to remove the etchant or cleaning chemical. The rinsing comprises: applying a liquid (claims 32 and 42) or vapor produced from a liquid (claims 37 and 42) having a lower surface tension than water, then dispensing a liquid DI water through a nozzle and applying the liquid DI water to the substrate, wherein the liquid (claims 32 and 42) or vapor produced from a liquid (claims 37 and 42) having a lower surface tension than water is applied to the frontside of the substrate separately from and not simultaneously with or while the liquid DI water and etchant or cleaning chemical are applied to the frontside of the substrate.

#### Claims 32, 37, 41, 47, 48, 51, 52 (EP 0905747 and Mertens)

The Examiner has rejected claims 32, 37, 41, 47, 48, 51, and 52 under 35 U.S.C. § 102(b) as being anticipated by *EP 095747*, and also under 35 U.S.C. § 102(e) as being anticipated by *Mertens*. It is Applicant's understanding that *EP 0905747* and *Mertens* are closely related and therefore Applicant discusses them together herein.

It is Applicant's understanding that neither *EP 0905747* nor *Mertens* disclose or suggest the element of "wherein the liquid (claim 32) or vapor produced from a liquid (claim 37) having a lower surface tension than water is **applied to the frontside of the substrate separately from and not simultaneously with or while**

the liquid DI water and etchant or cleaning chemical are applied to the frontside of the substrate."

The Examiner states that *EP 0905747* and *Mertens* disclose the steps of "spinning a wafer and application to the spinning wafer an etchant or cleaning solution and a gaseous substance having a lower surface tension than water and rinsing and drying" in the order claimed by Applicant in claims 32, 37, 41, 47, 48, 51 and 52. Applicant respectfully disagrees and urges that not only do *EP 0905747* and *Mertens* not disclose the successive and separate steps claimed by Applicant but that the references additionally teach away from the claimed steps by specifically disclosing and advocating the step of "supplying a surface tension reducing gaseous substance together with the liquid" to be removed. See *EP 0905747* [0011], and the corresponding part of *Mertens* at column 3, line 61 – column 4, line 16.

In response to Applicant's arguments submitted on October 29, 2007 the Examiner states on page 6 of the Office Action mailed February 25, 2008 that:

The applied documents teach not simultaneous application of different liquids. See at least column 3, line 61 – column 4, line 16 of *Mertens* and the corresponding part of the EP document. (Emphasis added by Applicant)

Applicant has again reviewed the entire references and in particular the part cited by the Examiner. It is Applicant's understanding that the Examiner appears to be focusing on *EP 0905747* [0011], and the corresponding part of *Mertens* at column 3, line 61 – column 4, line 16, states:

In another embodiment of the invention, eventually prior to the liquid removal step an etching, a cleaning or a rinsing liquid or a sequence of such liquids can be supplied to the entire surface of a rotating substrate. The parameters can be optimized such that a liquid film can completely cover a surface. The spinning motion will quickly transport the liquid over the surface towards the edge, thus allowing relatively short carry-over transients and thus allowing for relatively short rinsing times. Using such a continuously switched flow of liquids eliminates the undesirable passage of liquid-gas interfaces over the surface. (Emphasis added by Applicant).

Thus, *EP 0905747* [0011] discloses that **prior to the liquid removal step** (which is discussed below), a sequence of different etching, cleaning, or rinsing liquids can be supplied to a substrate. If the Examiner is relying on a separate section for the “not simultaneous application of different liquids” then Applicant requests the Examiner provide a more detailed explanation of the Examiner’s understanding in order to expedite the prosecution of the present application.

Applicant now refers the Examiner to the remaining portion of *EP 0905747* [0011], and the corresponding part of *Mertens* at column 3, line 61 – column 4, line 16, that states:

The liquid removal method of the present invention is applicable for each sequence of at least one wet processing step by supplying a surface tension reducing gaseous substance **together with the liquid**. The drying can thus be applied directly on the processing liquid if relevant for the application. Since the proposed drying technique is found to be very fast, process non-uniformity over the surface can be kept very low. (Emphasis added by Applicant).

Thus, *EP 0905747* [0011] discloses that during the liquid removal step (of an etching, cleaning, or rinsing chemical discussed above) a surface tension reducing gaseous substance is **supplied together with (i.e. simultaneously with) the liquid to be removed.**

Accordingly, Applicant respectfully submits that neither *EP 0905747* nor *Mertens* disclose or suggest the element of “wherein the liquid (claim 32) or vapor produced from a liquid (claim 37) having a lower surface tension than water is **applied to the frontside of the substrate separately from and not simultaneously with or while the liquid DI water and etchant or cleaning chemical are applied to the frontside of the substrate.**”

Furthermore, Applicant again refers the Examiner to pages 12-14 of Applicant’s arguments filed on July 23, 2007 and submits that it is clear from the cited paragraphs that *EP 0905747* and *Mertens* are limited to a cleaning and drying process where a local liquid-vapor boundary is created by **simultaneously applying both** a gaseous substance and the liquid to be removed. The local liquid-vapor

boundary is then guided to the edge of the substrate by moving the gaseous substance and liquid sources.

In view of the above remarks, a specific discussion of dependent claims 41, 47, 48, 51, and 52 is considered to be unnecessary. Therefore, Applicant's silence regarding dependent claims 41, 47, 48, 51, and 52 is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim.

Accordingly, Applicant respectfully requests withdrawal of the § 102 rejections of claims 32, 37, 41, 47, 48, 51, and 52 as being anticipated by *EP 0905747* and *Mertens*.

Claims 32, 34, 36-38, 40-44, and 46-50 (Lorimer)

The Examiner rejected claims 32, 34, 36-38, 40-44, 47-49 and 53-55 under U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,460, 552 by *Lorimer*. It is Applicant's understanding that *Lorimer* fails to disclose or suggest (1) applying a liquid (or vapor produced from a liquid) having a lower surface tension than water separately from and not simultaneously to or while applying the liquid DI water and etchant or cleaning chemical to the frontside of the substrate, and (2) dispensing a liquid DI water through a nozzle.

Firstly, *Lorimer* fails to disclose or suggest applying a liquid (or vapor produced from a liquid) having a lower surface tension than water to the substrate frontside separately from and not simultaneously to or while applying the liquid DI water and etchant or cleaning chemical to the frontside of the substrate. In fact, *Lorimer* teaches away from the use of a separate and not simultaneous liquid DI water rinse and instead *Lorimer* applies the low surface tension vapor and water vapor **combined as a single steam rinse**. See col. 7.

The Examiner states on pages 6-7 of the Office Action mailed February 25, 2008 that:

Lorimer teaches application of water vapor and/or water to the wafer separate from application of IPA-water vapor and/or liquid. The IPA-water mixture is readable on the liquid having surface tension lower than water. See at least column 7, lines 34-45, column 12, lines 5-30 and Figure 7a.

Applicant has reviewed the sections the Examiner has cited. Applicant respectfully points out that the cited section refers to steam cleaning the *active side* of the wafer, and deionized water cleaning the *back side* of the wafer. IPA can be added to either the steam (device side) and/or water (backside). Accordingly, Applicant respectfully submits that *Lorimer* does not disclose or suggest the element of "wherein the liquid (claim 32 and 42) or vapor produced from a liquid (claim 37 and 42) having a lower surface tension than water is applied to the frontside of the substrate separately from and not simultaneously with or while the liquid DI water and etchant or cleaning chemical are applied to the frontside of the substrate."

Secondly, *Lorimer* fails to disclose dispensing a liquid DI water through a nozzle (which applies the liquid DI water to the wafer frontside). Specifically, *Lorimer* discloses a workpiece cleaning system including a "vapor phase inlet positioned to apply a vapor phase to a first surface of the workpiece." Col. 4, lines 55-56. Then, "[t]he steam entering nozzle area 138 impinges on the wafer 30 near the center, and is quickly condensed as it proceeds toward the outer diameter by the relatively cool wafer." Col. 10, lines 33-37.

The Examiner specifically states on page 7 of the Office Action mailed on February 25, 2008 that

The applicants again argue that *Lorimer* teach application of vapor in a gaseous state, while the claims require application of a liquid DI water.

The Applicants rely on their *own unsupported statement* that the steam does not condense until after it is applied.

The Examiner disagrees. *Lorimer* teaches cleaning with steam and steam condensate. Nothing on the record indicates that there is no condensation until application to the wafer can be found in the document. In opposite *Lorimer* teaches application, cleaning with condensate, at least some of the vapor is condensed. It is also noted that *Lorimer* teaches that the vapor entering the nozzle area 138 is **quickly condensed** (column 10, lines 34-37). Such supports at least some

condensation of the vapor in the nozzle of Lorimer. (Emphasis added by Applicant).

Nevertheless, Applicant respectfully submits that *Lorimer* does not disclose what the Examiner purports and that Applicant's arguments are consistent with and supported by the disclosure of *Lorimer*. As is clearly stated in col. 10, lines 33-37, the steam entering nozzle area 138 impinges the wafer. Thus, gaseous steam impinges the wafer. Then, the **gaseous steam is condensed by the relatively cool wafer as it proceeds** to the outer diameter. Thus, it is clear that *Lorimer* dispenses a steam in a gaseous phase through nozzle area 138, and that the gaseous steam does not condense and form a liquid until after it is applied (impinges the wafer) and proceeds to the outer diameter of the wafer. To the contrary, Applicant claims "dispensing a liquid DI water through a nozzle" (which applies the liquid DI water to the substrate frontside) and not a vapor.

In view of the above remarks, a specific discussion of dependent claims 34, 36, 38, 40-44, 48, 49, and 53-55 is considered to be unnecessary. Therefore, Applicant's silence regarding dependent claims 34, 36, 38, 40-44, 48, 49, and 53-55 is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim.

Accordingly, Applicant respectfully requests withdrawal of the § 102 rejections of claims 32, 34, 36-38, 40-44, 47-49, and 53-55 as being anticipated by *Lorimer*.

**Claim Rejections - 35 U.S.C. § 103**

The Examiner alternatively rejected claims 39 and 45 under 35 U.S.C. § 103(a) as being unpatentable over *Lorimer* in view of Chang et al., U.S. Patent No. 6,273,099 ("*Chang*"). The Examiner alternatively rejected claims 38 and 39 under 35 U.S.C. § 103(a) as being unpatentable over any one of *Mertens* or EP 0905747 in view of *Chang*.

*Chang* is introduced to disclose the use of heated DI water. It is Applicant's understanding that *Chang* discloses an immersion rinse with heated DI water for batch processing, followed by three or more rinses. *Chang* fails to disclose or suggest a single substrate process, as well as the steps of applying an etchant or chemical, followed by a removal process consisting of applying a liquid having a lower surface tension than water, and a DI rinse, wherein the liquid having a lower surface tension than water is applied separately from and not simultaneously with or while the liquid DI water and etchant or cleaning chemical are applied. Therefore, *Chang* fails to remedy the deficiencies of *Lorimer*, *Mertens*, and EP 0905747.

In view of the above remarks, a specific discussion of the dependent claims is considered to be unnecessary. Therefore, Applicants' silence regarding any dependent claim is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 39 and 45 under 35 U.S.C. § 103(a) as being unpatentable over *Lorimer* in view of *Chang*, and the rejections of claims 38 and 39 under 35 U.S.C. § 103(a) as being unpatentable over any one of *Mertens* or EP 0905747 in view of *Chang*.



## CONCLUSION


Applicant respectfully submits that the present application is in condition for allowance. If the Examiner believes a telephone conference would expedite or assist in the allowance of the present application, the Examiner is invited to call the undersigned at (408) 720-8300.

Pursuant to 37 C.F.R. 1.136(a)(3), applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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